PREVALENCE OF MALNUTRITION AND ASSOCIATED FACTORS AMONG HIV-INFECTED CHILDREN AGED 6-59 MONTHS AT GONDAR UNIVERSITY HOSPITAL, NORTHWEST ETHIOPIA.

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Acronym

AIDS: Acquired immune deficiency syndrome

ART: Anti-retroviral treatment

GUH: Gondar university hospital

IRB: Institutional review board

MDG: Millennium developmental goals

OI: Opportunistic infection

RDA: Recommended daily allowance

SPSS: Software statistical package for social sciences

SSA: Sub-Saharan Africa

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Abstract

Introduction: malnutrition and HIV/AIDS are interconnected in a vicious circle, while HIV infection heightens vulnerability to malnutrition; malnutrition on the other hand degrades the immune system and heightens vulnerability to HIV transmission risk and disease progression. In order to get the targets of MDGs goal that aims to reduce malnutrition and child mortality, responsible bodies like governments and policymakers should address nutritional status of children particularly in those infected by HIV/AIDS.

Objectives: to assess prevalence of malnutrition and associated factors among HIV positive children aged 6-59 months at Gondar university hospital, North Gondar.

Method : institution based cross-sectional study was conducted on 142 HIV positive children aged 6-59 months in the paediatric ART clinic at Gondar referral hospital, North west Ethiopia. Data was collected from patient chart review using a structured questionnaire. Data were processed using Epi-info software and exported to SPSS for analysis. Logistic regression analysis were used to determine the effect of factors on the variables representing malnutrition (height for age, weight for age and weight for height0 and to control confounders.

Result: 142 cases of HIV infected children were included and out of which the prevalence of malnutrition was 40.8% underweight, 46.5% stunted, and 31.7% wasted. Regression analysis shows that the significant associated factors of malnutrition were child age, residency, exclusive breast feeding, bottle feeding, family size, and birth order, and opportunistic infections, level of CD4 percentage, ART, and parental marital status.

Conclusion: From the findings of this study, it is concluded that malnutrition is still an important problem among HIV infected children aged 6-59 months. I recommend nutritional management and dietary counselling to improve the nutritional status of HIV infected children on the subsequent follow up in the paediatric ART clinic.

Introduction

Statement of the problem

Nutrition is the cornerstone of socioeconomic development of a country as well as human health, growth and development. It is one of the essential components of millennium developmental goal. It is necessary to make a significant progress in nutrition in order to achieve other millennium developmental goal (MDGs)(1).Improving nutrition in infants and young children is essential to achieving the millennium development goal (MDGs) related to child survival (MDG 4) and eradication of extreme poverty and hunger (MDG 1)(2).

Poor nutrition is associated with reduced immunity, increased susceptibility to disease, impaired physical and mental development and less productive community. Malnutrition is one of the major public health in developing countries. Severe malnutrition significantly contributes for morbidity and mortality among children under the age of 5 years worldwide. Acute malnutrition is an extremely common disorder, associated with high rates of mortality and requiring specialized treatment and prevention interventions. The risk of mortality in acute malnutrition is directly related to its severity(3).

Many children with severe acute malnutrition die at home without care, but even when hospital care is provided, mortality rates may be high. Malnutrition can be best described in Ethiopia as a long term year problem due to chronic shortage of food in addition to high level of illness.In more than 50% of all deaths in childrenhave an associated wasting and stunting as an underlying cause. These children would have recovered from other illnesses if they had not been malnourished, but they die because they are malnourished(4).

Nutritional assessment is the tool by which the nutritionist evaluates the patient for adequate and normal growth and health,risk factors contributing to disease, and early detection and treatment of nutritional deficiencies and excesses, by using proxy measurements of nutritional adequacy. It provides an indication of the adequacy of the balance between dietary intake and metabolic requirement(5).

Often the assessment of nutritional status of children is determined by anthropometry that includes weight, height, mid upper arm circumference,

measurement of skin fold thickness, head and chest circumference, and in addition to anthropometry, biochemistry can be used which includes hemoglobin levels, urinary iodine, iron status, level of different nutrients or their products.(6)

Good nutrition and nutritional status is important particularly for HIV patients. This is because good nutrition helps keep your immune system strong, enabling you to better fight diseases, help the body process the many medication taken by people with HIV, may help with symptoms such as diarrhoea, nausea, and fatigue and metabolic abnormalities such as high blood glucose, cholesterol and triglyceride. In addition weight loss, wasting, and malnutrition continue to be common problems in HIV, despite more effective anti- retroviral medication, and can contribute to HIV disease progression(7).

HIV/AIDS, which is highly prevalent in sub Saharan Africa, may complicate child malnutrition in setting with high HIV prevalence such as Ethiopian. Since the outset of the AIDS pandemic, malnutrition was found to be frequent and became a good marker for poor prognosis among HIV infected subjects. An epidemiologic study on paediatric HIV suggests that nutritional status can have effects on quality of life and survival; this is may be due to the effect of malnutrition on immune function.HIV and its complication have been associated with nutritional disorder particularly when there is higher HIV viral load leading to a greater risk of growth failure in children(8, 9).HIV affects nutrition and its impact begins early during asymptomatic infection and it continues throughout the life cycle. HIV/AIDS has a negative impact on nutritional status & may lead to malnutrition. The relationship between HIV and nutrition is multidirectional. HIV can cause or worsen malnutrition due to decreased food intake, increased energy requirement and poor nutrient absorption.

In asymptomatic HIV infected children, resting energy expenditure is increased by about 10%, while increases in energy needs of between 50% to 100% have been reported in symptomatic HIV patient experiencing growth failure. So it is recommended to increase the energy intake of HIV-infected infants and children by 10% of the RDA for their age and sex if they are asymptomatic and by 20%-30% of the RDA if they are symptomatic or recovering from acute infections(10).

Literature review

Different studies have shown different results regarding patterns of nutritional status in HIV infected children. A retrospective study from Thailand which included about 143 children showed the results of nutritional status by height for age (HFA), weight for age (WFA), & weight for height (WFH)reported 23.1% was stunted where as 12.6% were underweight and 5.6% were wasted respectively.(11)

A secondary analysis of existing data from the international demographic and health survey (DHS) program from different countries in sub-Saharan Africa, data collected from 18 countries in SSA including Ethiopia during 2003-2008, the results suggest that across countries in SSA, children whose mother are infected with HIV are significantly more likely to be stunted, wasted or underweight compared to their counterparts of similar demographic & socioeconomic background whose mother are not infected.The multivariate analysis results suggests that across countries and communities in SSA,children aged under 5 year whose mothers are infected with HIVhave an average more than 25% higher odds of being stunted (28%), wasted (26%) or underweight (26%) compared to their counterparts of similar characteristics in households.(12)

A cross-sectional survey done in northeast South Africa targeting 671 children showed that the `prevalence of stunting was 18% in this age group, but though higher in HIV positive children (29%) than HIV negative children, the difference didn't reach statistical significance. Prevalence of underweight was 10% while that of wasting was 7%. There was also no significant difference in the levels of underweight and wasting by HIV status. Height & weight were all significantly lower in HIV positive children compared to HIV negative children. age was negatively associated with stunting where as children born to mothers younger than 25 years was positively associate with stunting. only low birth weight was significantly associated with underweight.(13)

Another a cross-sectional population based survey in children living in a community with high HIV prevalence in rural Uganda has shown that HIV infection has a direct effect in worsening children nutritional status. Of 5951 children surveyed, 91% underwent anthropometric measurement: 30% were underweight, 42% stunted, and

10% wasted. HIV sero-prevalence among children aged 2-12 was 0.7%. The prevalence of underweight was significantly higher in HIV-positive than HIV- negative children (52%vs 30%), as was the prevalence of stunting (68% vs. 42%), but there was no significant difference in prevalence of wasting (4% vs. 9%).(14)

A similar cross-sectional study in Raki district, Uganda that employed both qualitative and quantitative methodology found that HIV/AIDS orphaned children living with their elderly relatives have poor nutritional status.The results revealed high levels of malnutrition among orphaned childrenas almost half of them (47%) were found to be underweight. Underweight prevalence among orphans was twice that found in the general population(23%) for under five children.(15)

A cross-sectional study design underwent in western Kenya to compare the stunting,wasting, & underweight status among 102 & 99 under five children living in HIV affected and unaffected households respectively. Children in HIV affected households had a significantlyhigher degree of stunting (height-for-age <-2SD) than children in unaffected households (25.5% vs9.1%, P=0.002). The degree of wasting & underweight didn't differ significantly between HIV affected & unaffected households.(16)

according to EDHS preliminary report of 2011 for under five children showed, the prevalence of stunting was 44%;of which 21% were severely stunted, wasting was 10% and underweight was 29%.(17)

A case control study conducted in patients admitted to Gondar university hospital. The cases were 102 severely malnourished children under the age of five and the controls (102) were recruited. The study demonstrated parental illiteracy, monthly family income, and large family size with the number greater than 3 & in appropriate feeding practice to be a strong risk factor in children with severe malnutrition.(18)

An institution based cross-sectional study conducted on 301 HIV positive children in the paediatric ART clinics of Felege Hiwot and Gondar referral hospitals found that the prevalence of malnutrition was 41.7% underweight, 65% stunted and 5.8% wasted.the risk factors that was significantly associated was the age of the child(OR=4.10 for underweight and OR=1.85 for stunting), absence of dietary counselling(OR=3.78), presence of eating problems (OR=2.14), family's monthly

income (OR=3.08), late HIV diagnosis(OR=4.03) and duration of follow-up at ART clinics(OR=3.33).(19).

Justification

The mortality of HIV infected children are significantly influenced by their nutritional status and the number of deaths contributed by severe acute malnutrition is still unacceptably high in almost all developing countries particularly sub-Saharan countries like Ethiopia. Different studies have shown different results as to the pattern of nutritional status of HIV infected children. However, most of nutritional status studies are done in adult population. In addition to this, there is limited knowledge and studies on the pattern of nutritional status HIV infected children in Ethiopia. Few of the studies on this topic are very much outdated and not matching with the current epidemiology. This study will help in identifying and filling the gap in the pattern of nutritional status in HIV infected children in University of Gondar hospital in paediatric wards which will help in evaluating and treating such patients. In addition to this, the study can also be used as a reference for other studies.

Objective

General objective

To assess prevalence of malnutrition and associated factors among HIV infected children aged 6-59 months at Gondar university hospital, paediatric ART clinic, Northwest Ethiopia.

Specific objectives

- To determine prevalence of malnutrition among HIV infected children aged 6-59 months at GUH, paediatric ART clinic.
- To identify associated factors of malnutrition among HIV infected children aged 6-59 months at GUH, paediatric ART clinic.

Methods

Study design

An institution based cross-sectional study was conducted in the paediatric anti-retroviral treatment (ART) clinics of Gondar university referral hospital located in Gondar town northwest Ethiopia.

Study area and period

The study was conducted in the university of Gondar teaching hospital which is found in Gondar city administration, located 729 km far away from the capital city, AddisAbaba, Amhara national regional state, in the north of Ethiopia. Gondar university hospital is a teaching as well as referral hospital under ministry of education. It is a long serving teaching hospital with both undergraduate and postgraduate studies. The hospital provides higher level of clinical care for nearly 5 million of catchment area of population. The hospital gives outpatient and inpatients services in its different departments. It has a range of specialties including paediatrics, surgery, internal medicine, gynaecology, ophthalmology, and others. It has a total of 400 beds giving service for admitted patients. The study was conducted from May 1, 2014 to December30, 2014.

Study population

The study populations were all HIV infected under 5 year children who were attending paediatric HIV follow up clinic.

Inclusion and exclusion criteria

Inclusion criteria: those HIV-positive children aged 6-59months whose medical record is available in the archive.

Exclusion criteria: children with no anthropometric evaluation

Sampling method

No sampling method was used since all patients fulfilling the inclusion criteria was included.

Study variables

Dependent variable: malnutrition indicated by underweight, stunting and wasting.

Independent variable:

Socio-demographic variables;

- Age,
- Sex,
- Residency,
- Religion,
- Family size,
- Birth order and
- Parental marital status.

Child nutritional practice;

- Breast Feeding,
- Complementary Feeding And
- Bottle Feeding.

Medical problems characteristics:

- Opportunistic Infections,
- Anti-Retroviral Treatment,
- Stage And
- Immunization.

Data collection

Data was collected by patient chart review from paediatric HIV follow up clinic registration list book after ethical clearance from responsible body. The chart was collected from HIV follow up clinic of UOG. Data was collected using a pretested data extraction format which includes socio-demographic data, anthropometric measurement and medical and related factors of the study children. Data was collected by the Data collector. Additionally, questionnaires were checked for completeness before data entry. The nutritional status of the study was assessed using the standard indicators of weight-for-age (WFA), height-for-age (HFA), weight-for-height (WFH) and mid upper arm circumference (MUAC).

Data processing and analysis

Data obtained from the study was entered,cleaned & verified using epi-info. Then, the data were exported to SPSS version 20 for analysis after the study is completed and will be described by mean anthropometric finding as well as prevalence of malnutrition (stunting, underweight and wasting). Descriptive summary using frequencies, proportions, graphs and cross tabs was used to present the study result. Bivariate and multivariate logistic regression analyses were conducted to determine the effect of factor(s) on the outcome variable representing malnutrition and to control possible confounders. Analysis was carried out at two steps. Initially, a bivariate analysis was performed to determine the association of malnutrition and associated factors. Statistical association was checked by 95% confidence interval and crude odd ratio. Later, the significant variables (p-value<0.2) observed in bivariate analysis were subsequently included in multivariate analysis. Finally, 95% confidence interval and adjusted odd ratio were checked and the significance variables were taken as associated of malnutrition. P-value less than 0.05%, 95%CI and odd ratio were considered as a statistically significant.

Ethical consideration

Ethical clearance was obtained from Ethical Review Board of university of Gondar, College of Medicine and Health Sciences, Institute of Public Health and permissions obtained from the medical director's offices of the Hospitals by giving a support letter.

Result

Socio-demographic characteristics

A total of 142 children on HIV/AIDS care & treatment from university of Gondar referral hospital paediatric follow up clinic were studied. Among the total children aged 6-59 months, there were 73(51.4%) female & 69(48.6%) male children in this study. 12(8.5%),38(26.8%),33(23.2%),24(16.9%),35(24.6%) children were found in the age groups of 6-11,12-23,24-35,36-47&48-59 months respectively. Majority (n=86, or 60.6%) came from urban areas. The majority of the study group (n=126, or 88.7%) were orthodox Christians & the rest were Muslims and others (table 1).

The family size of the household is breakdown as follows, household having children 3 or less (51.4%) had the highest percentage while households having 4 or more children had the least percentage (48.6%). From the study it was observed that 34.5% of the study groups are the 1^{st} child for their family & 27.5% of them are the 2^{nd} child & the rest (38%) are from 3^{rd} to 7^{th} child for their family.

Nearly half (57.7%) of the study subjects were living with both parents, 31.7% with divorced parents, 7% with widowed mothers & 3.5% of them were single parents(mother).

Characteristics of child nutritional practice

All (100%) of the 142 under five children were breastfed but only 106 (74.6%) were exclusively breastfed for six months. More than one-fourth (n=36, or 25.4%) were given mixed feeding & no one was on only exclusive replacement feeding. Among under five children who were on breast feeding, majority 111 (78.2%) were started complementary feeding at the recommended age of 6 month & the remaining were supplemented after 6 months of age.

From the study it was observed that 42(29.6%) of the study subjects were on bottle feeding & 100 (70.4%) of study subjects were not on bottle feeding.

Table 1: socio-demographic characterstics of HIV positive children at GUH, pediatric ART clinic,Northwest Ethiopia

	characterstic	*Number*	*Percent*
Age in month	6-11	12	8.5
	12-23	38	26.8
	24-35	33	23.2
	36-47	24	16.9
	48-59	35	24.6
Sex	Male	69	51.4
	Female	73	48.6
Residence	Urban	86	60.6
	Rural	56	39.4
Religion	Orthodox	126	88.7
	Muslim	13	9.2
	others	3	2.1
Number of	3 or less	73	51.4
children	Above 3	69	48.6
Birth order	1st born	49	34.5
	2nd born	39	27.5
	3rd or above	54	38.0
Parental status	Married	82	57.7
	Divorced	45	31.7
	Single	5	3.5
	Widow	10	7.0

Medical problem characteristics

Of the total 142 children having follow up in the antiretroviral treatment (ART) clinic, CD4% above 25% is seen in (35.9%) of the study subject, followed by 35.2% with CD4 percentage in the range between15-25% & the least CD4 percentage (28.9%) was below 15%(severe immunosuppresion). More than one third (n=52, or 36.7%) of children were in the advanced stage of the disease (stage lll or lV).

Almost half of the children (n=74, or 52.1%) had opportunistic infections. Tuberculosis was the leading opportunstic infection (both pulmonary TB & extra pulmonary TB) (n=27,or 30%), followed by skin infections (n=24 or 26.7%), oral candidiasis (n=17, or 218.8%) & unexplained persistent diarrhea(15.5%). Other forms of opportunistic infections accounts for 8.9%.

About one third of the children (38.7%) were on ART when they were enrolled in the study, while the rest had not yet started ART. Majority (n=117, or 82.4%) of children were fully vaccinated according to expanded program of immunization, the rest were either partially vaccinated or unvaccinated.

Table 2: Medical problems of HIV positive children on paediatric ART clinic follow up at GUH, North west

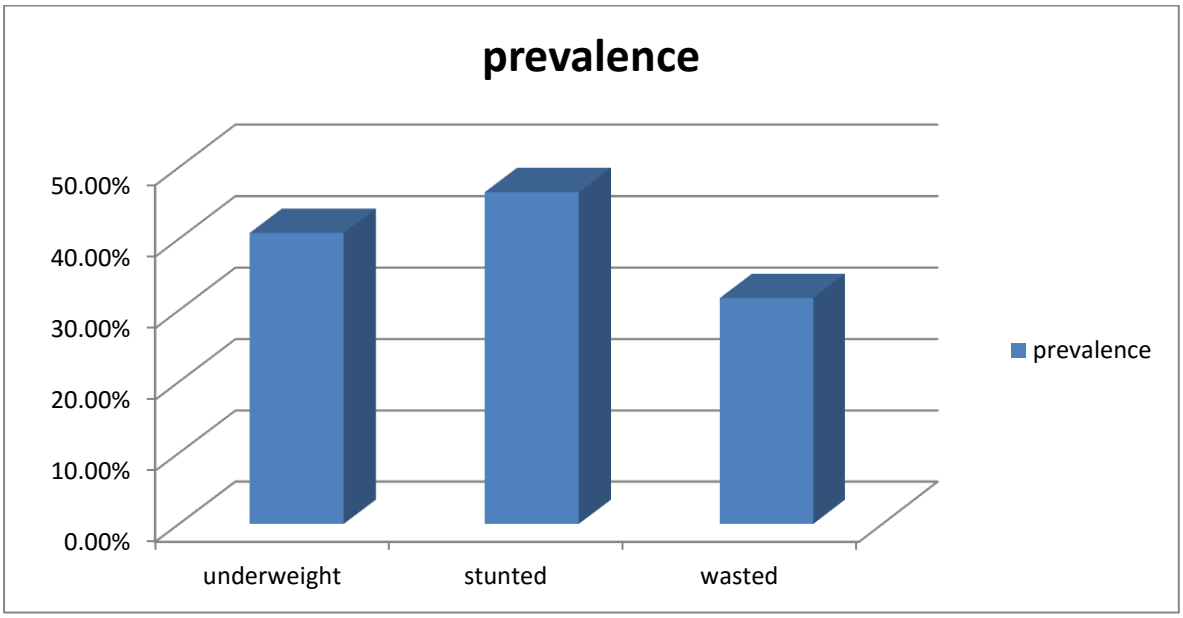
	characteristic	*Number*	*Percent*
Opportunstic infection	Yes	74	52.1
	No	68	47.9
Type of OI	Tuberculosis	27	30
	Skin infections	24	26.7
	Oral candidiasis	17	18.8
	Persistent diarrhoea	14	15.5
	others	8	8.9
WHO clinical stage	Stage I	68	47.9
	stageII	22	15.5
	stageIII	37	26.1
	stageIV	15	10.5
CD4%	<15%	41	28.9
	15-25%	50	35.2
	>25%	51	35.9
ART	Yes	55	38.7
	No	87	61.3

Prevalence of malnutrition among the children with HIV/AIDS.

The prevalence of malnutrition for those aged 6months upto 5 year were 68.3% (n=97). Among these children, 22.5% (n=32) had moderate acute malnutrition (MAM), where as 16.2% (n=23) had severe acute malnutrition (SAM). About 31.7% (n=45) of the children had wasting whereas stunting accounts for 46.5% (n=66) of the children

attending the ART clinic. The prevalence of underweight is 40.8% (n= 58), while there was 8 (5.6%) cases of kwashiorkor and 21 (14.8%) cases of marasmus. There was no a single case with marasmic-kwash during the study (figure 1).

Figure 1: Prevalence of malnutrition in HIV positive under-five children at paediatric ART clinic, Northwest Ethiopia.



Factors associated with malnutrition

Associated factors of stunting: Based on the multivariate logistic regression analysis of this study, residency, percentage of CD4 count, opportunistic infection, exclusive breast feeding and bottle feeding were significantly associated with stunting. Children who was brought from urban 3 times less likely to be stunted than those from rural (AOR=0.36; 95% CI=0.16,0.87)(table 2).

Another association obtained from this study result, those children having a CD4 percentage above 25% were less likely to be stunted than children whose CD4 percentage having less than 15%(AOR=0.32; 95% CI=0.12,0.91).

Regarding the association of opportunistic infections with stunting, children who had opportunistic infection had twice increased risk of having stunting than those who had not opportunistic infection(AOR=2.49; 95%CI=1.10,5.66).

This study result also revealed that, children who were only on exclusive breast feeding in their first 6 months during infancy were at a lower risk of stunting as

compared to those who were not on exclusive breast feeding (AOR=0.25;95%CI=0.09,0.71).

The analysis showed also those children who was using bottle feeding during childhood was nearly 3 times at higher risk of having stunting in contrast to those who were not using bottle feeding(AOR=2.91;95%CI=1.12,7.57).

Table 3: Factors associated with stunting among HIV positive under five children at paediatric ART clinic, GUH, Northwest Ethiopia.

Explanatory variables	*Stunting*		*COR(95% CI)*	*AOR(95% CI)*
	Yes	No		
				Resident
Rural	34	22	1	1
Urban	32	54	0.383(0.192-0.766)*	0.360(0.159-0.816)*
				CD4
Below 15%	27	14	1	
Between 15-25%	24	26	0.479(0.204-1.121)	0.492(0.180-1.341)
Above 25%	15	36	0.216(0.089-0.522)*	0.325(0.116-0.909)*
				OI
Yes	39	22	3.545(1.765-7.122)**	2.495(1.100-5.660)*
No	27	57	1	1
				EBF
Yes	38	28	0.160(0.066-0.385)**	0.249(0.087-0.709)*
No	68	8	1	1
				Bottle feeding
Yes	31	11	5.234(2.349-11.662)**	2.913(1.121-7.568)*
No	35	65	1	1
				Complementary feeding

appropriate	45	66	1
delayed	21	10	3.080(1.326-7.156)*
			Marital status
Married	32	50	1
Not in marital union	34	26	2.043(1.039-4.019)*

* significant at P-value 0.05% ** significant at P-value 0.01

Associated factors of underweight: with regard to the key variables affecting underweight, family size & birth order were significantly associated with underweight in the final multivariate analysis.

Analysis of this study showed that, those children living in a family size with a number of children 3 or less were about 4 times less likely to be underweight than those children with a large family size with a number of children 4 and above (AOR=0.45;95%CI=0.22,0.93)(table 3).

It is observed that the likelihood of underweight for those who are second child in the family were at a lower risk than in compared to those who were the first child (AOR=0.33;95%CI=0.13,0.86).

Table 3: factors associated with underweight among HIV positive children at GUH, pediatric ART clinic, Northwest Ethiopia

Explanatory variables	***Underweight***		***COR(95% CI)***	***AOR(95% CI)***
	Yes	**No**		
				Age in months
6-11	2	10	1	
12-23	16	22	3.636(0.699-18.918)	
24-35	13	20	3.250(0.611-17.283)	
36-47	9	15	3.000(0.533-16.897)	
48-59	18	17	5.294(1.010-27.748)*	
				Family size
3 or less	23	50	0.447(0.226-0.885)*	0.451(0.218-0.933)*
Above 3	35	34	1	
				Birth order
First child	22	27	1	1
Second child	9	30	0.368(0.145-0.937)	0.330(0.127-0.861)*
Third or above	27	27	1.227(0.565-2.665)	0.967(0.426-2.196)

* significant at P-value 0.05% ** significant at P-value 0.01

Associated factors of wasting: from multivariate analysis, under-five children's WFH was significantly associated with child age, opportunstic infections, antiretroviral treatment(ART), exclusive breast feeding, birth order and parents marital status. Children age group 12-23 months were about 18 times more likely to be wasted than children age 6-11 months(AOR=18.16; 95% CI=1.32,248.09).

Another association found in this study result, those children who had opportunistic infection during their childhood was three times at higher risk of wasting than those with no opportunistic infections(AOR=3.20; 95%CI=1.13,9.07)(table 4).

From the analysis it was also observed that, those children who was taking anti-retroviral drugs was at a lower incidence of having wasting than children who were not taking anti-retroviral drugs(AOR=0.14; 95%CI=0.04,0.49).

The study result also shows, children who was only on exclusive feeding was at lesser risk of becoming wasted in comparison to those children who were not on exclusive breastfeeding(AOR=0.05; 95%CI=0.01-0.21).

The odd of being wasted for children was six times higher in children with a birth order of either third or above in contrast to those who were the first child in their family(AOR=6.03; 95%CI=1.73,21.05).

Analysis of this study also showed that, children living in a family who was not in a marital union was nearly 3.5 times more likely to be wasted as compared to those children living in a family whose parents are married(AOR=3.61; 95%CI=1.31,9.94).

Table 4: factors associated with wasting among HIV positive children at GUH, pediatric ART clinic,Northwest Ethiopia

Explanatory variables	*Wasting*		*COR(95% CI)*	*AOR(95% CI)*
	Yes	No		
				Age in months
6-11	1	11	1	1
12-23	17	21	8.905(1.043-76.039)*	18.157(1.329-248.099)*
24-35	10	23	4.783(0.542-42.206	2.606(0.185-36.641)
36-47	6	18	3.667(0.388-34.648)	6.001(0.384-93.686)
48-59	11	24	5.042(0.577-44.066)	4.615(0.348-61.524)
				Resident
Rural	25	31	1	

Urban	20	66	0.376(0.182-0.777)	
				OI
Yes	26	35	2.424(1.177-4.991)	3.204(1.132-9.069)
No	19	62	1	1
				ART
Yes	11	44	0.390(0.177-0.859)*	0.141(0.040-0.498)*
No	34	53	1	1
				EBF
Yes	23	83	0.176(0.078-0.398)**	0.052(0.012-0.214)**
No	22	14	1	1
				Bottle feeding
Yes	23	19	4.292(1.987-9.270)**	
No	22	78	1	
				Complementary feeding
Appropriate	29	82	1	
Delayed	16	15	3.016(1.326-6.861)	
				Birth order
First child	10	39	1	1
Second child	10	29	1.345(0.495-3.654)	2.411(0.605-9.605)
Third or above	25	29	3.362(1.399-8.080)*	6.034(1.729-21.052)*
				Marital status
Married	17	65	1	1
Not in marital union	28	32	3.346(1.602-6.987)*	3.606(1.308-9.944)*

* significant at P-value <0.05% ** significant at P-value <0.01

Discussion

This study found that the overall prevalence of malnutrition among HIV positive children aged 6-59 months ,as computed from the anthropometric measurements ,was 68.3% and among these children, 40.8% underweight, 46.5%stunted and 31.7% had different degrees of wasting. This finding is higher as compared to the overall nutritional status Ethiopian children below five years of age which was reported by EDHS 2011study in which the prevalence of underweight, stunting and wasting were 29%, 44% and 10% respectively.(17) This greater difference in nutritional deficit between the groups can be explained by the difference in their rural/urban composition of the samples and the differences in HIV status.

The prevalence of stunting (46.5%) in this study was higher than the national EDHS values which is 44% for under five children of unknown HIV status which may be due to the associated HIV disease resulting in a form of chronic malnutrition which might be due to decreased food intake, increased energy requirement and poor nutrient absorption in long duration of time.(20)

Wasting indicates the presence of acute malnutrition in the period immediately preceding the survey as a result of inadequate food intake or a recent episode of illness causing weight loss. The fact that wasting in HIV positive under five children was found to be almost three time higher than the national value can be explained by the presence of such factors just preceding the survey.

However, the prevalence in the current study was lower in respect to stunting, had similar result to underweight and wasting was almost 5 times higher to a study conducted in Gondar university hospital which was reported to be 65% stunted, 41.7% underweight and 5.8% wasting.(19) This could be due to the different instrument used or it could be a real difference.

As showed in this study result, prevalence of wasting higher but prevalence of underweight and stunting were lower as compared to study done in Uganda, in which 9% wasted, 52% underweight and 68% stunted.(14) This might be due to the difference in socioeconomic characteristics, sample size, study area and period and health service delivery.

This study found a higher prevalence of malnutrition compared to a community based study on HIV/AIDS orphans in Kenya(29.3% stunted,13.2% underweight and 3.4% wasting)(21), but lower levels of under nutrition, particularly underweight (47%) in a community based study in orphan HIV positive children in Raki district, Uganda.(15) This is also can be explained by the fact that the socioeconomic characteristics & healthy service delivery of these countries could be different.

Moreover, the prevalence of stunting in this study is two times higher as compared to the study done in HIV affected households in western Kenya which is 25.5%.(16) Results also revealed that prevalence of stunting, underweight and wasting are higher than a cross-sectional study conducted in northeast South Africa with the prevalence of 29% stunting, 10% underweight, and 7%wasting.(13) This shows a clear difference in nutritional status between these areas which might be due to a better economical, nutritional and health care status in South Africa.

The prevalence of malnutrition in this study in those children taking anti-retroviral treatment (ART) drugs had lower incidence of malnutrition as compared to a study in Botswana in children who were taking ART (59% underweight, 75% stunted).(22) This lower result might be due to the fact that children who receive ART might have good appetite, good nutrient absorption and less severe and number diseases which can also either directly or indirectly affect the nutritional status of these children.

In addition, the result of the survey also revealed that a much higher prevalence of nutritional status by height for age, weight for age and weight for height in contrast to a retrospective study done in Thailand which reports 23.1% of stunting,12.6% underweight and 5.6% wasting.(11) This difference may be reasoned in two ways. First, the setting of the studies are different (the Thailand study was community based). Second, the current study was on children living with HIV/AIDS.

Breast feeding is a norm in Ethiopia; all the children in the study group were breastfed. The national survey indicated that 98% of children under the age of five are breastfed for some period of time.(17) The percentage of children who were only exclusively breastfed were at lower risk of stunting (AOR=0.25;CI=0.09,0.71) and lesser risk of becoming wasted than to those who were not on exclusive breastfeeding. A study done in china showed that the introduction of other diets before age of six months increased prevalence of pneumonia and diarrheal

disease.(23) As a global public health recommendation, infants should be exclusively breastfed for the first 6months of life to achieve optimal growth, development and health.

Bottle feeding showed a significant association with stunting. Bottle feeding is discouraged at any age. It is usually associated with increased risk of illness, and especially diarrheal disease, because of the difficulty in sterilizing the nipples properly. Bottle feeding also shortens the risk of postpartum amenorrhea and increases the risk of pregnancy.(17)

A large family size is significantly associated with underweight but no association with stunting. Those children living in a family size with a number of children 4 or more are about 4 times more likely to be underweight than those children with a number of 3 or less. The effect of a large family size with overcrowding and inadequate spacing has been implicated as a risk factor for malnutrition in other different studies as well.(24, 25) This supports the idea that non-nutritional factors should also be addressed in an effort to reduce malnutrition in Ethiopia.

Among children with opportunistic infections, those with opportunistic infection was twice stunted and three times wasted than children with no episode of opportunistic infections. This can be explained by the fact that opportunistic infections can cause decreased food uptake, loss of nutrients due to diarrhoea, poor nutrient absorption, and increased energy requirement.

This study revealed that those children having CD4 percentage above 25% were less likely to be stunted than children whose CD4 percentage was less than 15%. This finding is also consistent to a study done three tertiary hospitals in Uganda and Zimbabwe.(26) This is may be partially reasoned due to the risk of immunosuppresion which can predispose to recurrent and severe diseases.

Those children who were on anti-retroviral treatment before enrolment were at a lower incidence of being wasted than children who were not taking drugs. This study also in line to a study done in Botswana.(22) This could be due to the fact that those children taking ART for long time might have good immune response to fight infection so that less number and severity of disease and might have also good appetite.

Conclusion and recommendations

This study revealed that, there is high prevalence of stunting, wasting and underweight in HIV positive children at paediatric ART clinic in Gondar referral hospital. Child age, residency, exclusive breast feeding, bottle feeding, family size, birth order, opportunistic infections, level of CD4 percentage, ART, and marital status were significantly associated factors. Thus, nutritional management, dietary counselling for caregivers and proper feeding habits besides treatment with ART drugs and OI treatment. As early diagnosis of HIV and treatment helps to decrease risk of malnutrition, caregivers should be encouraged to bring their children for screening and follow up as early as possible.

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